97-84081-21

University of Ariz.

Inaugural bulletin

Tucson, Ariz.

[1930?]

97-84081-21
MASTER NEGATIVE #

COLUMBIA UNIVERSITY LIBRARIES
PRESERVATION DIVISION

BIBLIOGRAPHIC MICROFORM TARGET

ORIGINAL MATERIAL AS FILMED - EXISTING BIBLIOGRAPHIC RECORD

308
Z
Box 330

Arizona. University.
Inaugural bulletin. Tucson. University of Arizona [1930]
cover-title. 54 p. 24 cm.

Contents.--The university and natural resources. by George Otis Smith.--Beauty in American life. by Lorado Taft.--The unity of nature as illustrated by the Grand Canyon. by John C. Merriam.--Greeting by John C. Phillips.--Inaugural address of Homer Leroy Shantz as president of the university.

ONLY ED.

RESTRICTIONS ON USE: *Reproductions may not be made without permission from Columbia University Libraries.*

TECHNICAL MICROFORM DATA

FILM SIZE: 35mm REDUCTION RATIO: 11:1 IMAGE PLACEMENT: IA (IIA) IB IIB

DATE FILMED: 5/9/97 INITIALS: TLM

TRACKING # : 24353

FILMED BY PRESERVATION RESOURCES, BETHLEHEM, PA.

Through the President's Office

Inaugural Bulletin

308
Z
Box 330

PUBLISHED BY
University of Arizona
TUCSON, ARIZONA

June 23, 1931 DAHER

On April twenty-fourth, nineteen hundred and thirty, Doctor Homer Leroy Shantz was inaugurated as President of the University of Arizona. The exercises of the day consisted of a Symposium on the Opportunities and Responsibilities of the University of Arizona, held in the morning, and the Inaugural Exercises, proper, in the afternoon. The addresses delivered during the day are now printed by the University.

THE UNIVERSITY AND NATURAL RESOURCES

GEORGE OTIS SMITH, PH, D.
United States Geological Survey

Arizona's greatest resource is the coming generation—the citizens of tomorrow. To these young men and women who must furnish leadership in the State this University stands as *alma mater*, a fostering mother in a special and particular sense. All that I have to say this morning may be summed up in the simple truism that it is only through the education of Arizona's citizens that all her other resources can and will be utilized to the best advantage. The human resource is the first concern of the State, or as Owen Young recently put it, trained brains are a country's greatest asset and without them natural resources are as nothing. My major premise today is that Arizona is blessed with both.

I term the relationship of the University of Arizona to the youth of Arizona as primarily that of a fostering mother for the simple reason that this is a publicly endowed institution, with a public purpose. Under several acts of Congress, the first of which was signed by President Lincoln nearly seventy years ago, the Federal Government cooperates with the States in a program of higher education in those arts that constitute the foundation stones of industrial life. This partnership between State and Nation is logical in its recognition of education as both a local and a national duty—simply because citizenship carries obligations to Nation as well as to State, and the training of citizens is peculiarly the function of the State university. Here in Tucson is centralized the responsibility for fitting young students to be citizens of no mean State and of no mean Nation. The vision of our fathers in planning this partnership back in the dark days of Civil War was, in the words of the late President James of Illinois, "the beginning of one of the most comprehensive, far-reaching, one might almost say grandiose schemes for the endowment of higher education ever adopted by any civilized nation."

This broad cooperative basis for the support of citizen training is correct in principle and successful in practice. As the industrial, economic, and financial structure of the Nation rises, technical

education must furnish a more comprehensive preparation for the new conditions, and with the increasing complexity of life a broader culture is demanded, lest the changing order trend toward lowering the standards of citizenship.

As I read that organic act of 1862 that joined Nation and State in an extensive educational experiment I note that it specifies "liberal and practical education of the industrial classes." This was class legislation of the right sort—higher education for the workers, for upon this class the State depends. So it follows that with the emphasis always kept on training for citizenship, the program of this University includes research directly related to Arizona's natural resources and teaching that will apply the truths of modern science to the tasks of modern life here in the Southwest. Privately endowed institutions of higher learning may have more general aims and follow broader paths of research, even exploring the utmost limits of the universe for new planets, but here at this public institution the star to which your wagon must be hitched is Arizona.

Here in Arizona the relation between human worker and natural resources is simple and intimate. Mining and metallurgy, agriculture and forestry, all depend directly upon Mother Earth, and no demonstration from this platform is needed to point out to those of you who may be entering upon your life work the significance of the fact that your home State is blessed with great wealth in soil and waters and in minerals hidden beneath the surface. Nature has furnished the setting for a prosperous commonwealth, the opportunity for successful endeavor. And be it noted that I place first the prosperity of the commonwealth—I mention the body politic before the individual.

There is a community of interest in the development of resources that transcends all that can be done for personal gain; indeed, self-interest becomes enlightened only when it sees that the whole includes the parts and that, in the long run, individual success is promoted by serving the public interest. In the industrial world the trend of highly competitive struggle has long been toward bigger and bigger business and larger and larger output, until mass production has seemed the open sesame with which any economic secret can be unlocked. Yet the thoughtful observer has noted of late that this so-called rationalization of industry

has gone to irrational extremes. Overabundance of such essentials as wheat and copper may become an economic liability, and both nation and citizen can suffer from the sin of overproduction. Never before these recent years of plenty have we realized so keenly that too much can be as profitless as too little.

In similar fashion the individual seeker for success, be that individual a citizen or a corporation, must think beyond the confines of any one business or any one industry. Our national structure has withstood the shocks of a century and a half largely because it derives strength from the economic as well as political union of many states. So in this State of yours economic vigor can persist only as your varied industries are united in a common policy. Balanced production is the industrial ideal—that happy coordination of agriculture with mining and sane development of diversified industries that makes for economic independence of State or Nation. Many of us have watched from a distance the wisely directed coordination of Arizona's business activities, an economic movement in which so many interests have cooperated. No other State has gone further in this direction.

Conservation can be most tersely defined as taking thought for the morrow, and conservation as an economic policy has the prime purpose of serving the common interest. In its all-embracing survey of the present and its far-flung vision of the future, conservation is largely a matter of educated eyesight; in its sympathetic understanding of what democracy means in economics, conservation is a matter of twentieth century humanities. It follows that conservation broadly and specifically applied to Arizona needs to be given a large place in the research and teaching program at this University. As bearing upon the conversion of natural resources into contributions to the larger life of the State, conservation must be taught in your College of Mines and Engineering, in your College of Agriculture, and above all in your Department of Economics. Such courses as "Geology of Arizona," "Range Ecology," "Agricultural Economics," "Principles of Marketing," and "Rural Sociology" are among those bearing directly upon the major problem of Arizona's development. They aim straight at the target.

In her industrial development Arizona is young and with the strength of youth goes the urge to use youth's resources, and on a

scale of expenditure perhaps not altogether wise. There is a reason for both pride and pause in the fact that Arizona has just experienced its best year in metal production with an output worth more than 150 million dollars. This increase of more than 6,000 tons in the annual contribution to the country's needs in those useful metals, copper, lead, and zinc is a tribute to Arizona's mining industry, yet there is another side to the shield: we must not overlook the fact that the 425,000 tons of virgin metal produced from Arizona mines and smelters in 1929 represents a withdrawal of mineral assets that can never be replaced.

Arizona has neighbors whose mining glory may be in large degree of the past, and we now realize the important part the mines have played in the building of those States. Today their effort is to revive and restore the mining activity and thus effect a better balance in industry. Arizona, on the contrary, has not yet reached her peak and her outlook is rosy. Yet it is not too early to ask yourselves the very pertinent question, How long can these mountains of Arizona continue to furnish the ore to your mills and smelters? And your question takes on nation-wide significance when we rephrase it to read, How long can Arizona smelters continue to furnish the metals that the Nation needs to meet the constantly changing and ever-expanding demands of civilization for new machines, new tools, new masterpieces of architecture?

So it is that I urge those who guide the policy of this University to see the practical and immediate value of conservation to Arizona. No longer is conservation a matter of sentiment or of propaganda to be honored once a year in a week set apart for its observance by Congressional enactment as was recently proposed in Washington. Conservation—by which I mean use without waste—deserves to be a religion with mining engineers, not a religion to preach so much as a religion to practice. Practical conservation in a special sense belongs to the mining and metallurgical engineer. He stands as the keeper of the vaults in Nature's treasury. His is the responsibility to meet the demands of civilization. Dwindling supplies call upon the mining geologist to find other deposits, the mining engineer to make them available, the metallurgist to devise improved methods for higher recovery of metal content and for profitable handling of leaner ores—

theirs is the joint duty to keep up the flow of raw materials to industry.

Nor is it enough merely to respond to these demands: the mining engineer must also realize the unalterable limitations of supply. Optimism can not add a ton to Nature's store of indispensable minerals upon which we are making larger and larger inroads each year. I was glad to hear the president of a great mining company oppose those who profess unbounded faith in Nature's continued generosity to America with the plain warning: "To those who state that 'America has just started' the uncontrovertible answer is that so far as our national resources are concerned America is well on its way."

Here in Arizona the years of maximum drafts upon the reserves of ore in sight should also be the time of largest activity in a well organized search for new reserves. Geologic exploration should keep pace with mining expansion. The Arizona Bureau of Mines as a research department of the University holds a strategic position for service, but that position needs reinforcement in order to make its service adequate. A thorough survey of the State's resources under the auspices of this Bureau in cooperation with Federal agencies would be the best insurance policy Arizona could buy. And we know that the best time to take out an insurance policy is in youth.

Chief among the resources on which Arizona must depend through the years to come is the water that flows in her rivers or is found stored beneath her deserts, a perennial source of energy for industry and of life for agriculture. Planning for the future at once raises these questions: Can more water be stored to add more fertile acres to the abiding assets of this State? Where are the largest storage basins and the best dam sites? What is the extent of the underground supply and at what rate can it be safely drawn upon? Are the forests and range tributary to the ranch lands being preserved so as to furnish the grazing lands needed? Train your graduates to answer questions such as these, and the University of Arizona will contribute generously to the permanent prosperity of your State.

The phrase "mastery of environment" well describes the larger factor in human progress, and that progress is furthered by

research which looks to the conquest of natural conditions that not only try men's souls but test their inventive genius. Such research logically belongs in this University, and the logical leader in such research is your new President. Dr. Shantz traces his scientific ancestry to Prof. Charles E. Bessey, a craftsman in the molding of men who have become leaders in the science of botany. Much of the notable success of the Bureau of Plant Industry at Washington can be credited to well-trained students from Professor Bessey's department of botany at the University of Nebraska, and from this productive group President Shantz has come. Homer Leroy Shantz has a sagebrush background, and he knows the foothill and mesa atmosphere. He has traced the life history and watched the seasonal struggles of plants to live where water is a luxury. His own studies have extended from Nevada to Africa but have commonly touched the borderland of desert and semi-arid regions, where plants with the aid of man must conquer a hostile environment, and that is the type of research that this University should offer to its students.

None of us can see far enough into the future to realize what are to be the economic developments even of the morrow. Year after year as I visit the West my imagination is stimulated as I see fields of golden grain or of green alfalfa pushing back the gray sage brush, and as I watch the trainloads of melons and lettuce and citrus fruits speeding across the continent to feed the eastern cities. It is this winning of the desert by Arizona's pioneer men and women and this conquest of distance by your railroads that together have made this youngest of States so important a member of the Federal family.

I would not wish, however, to leave with you any idea that transportation is a desirable end of itself: it is only a desirable means where necessary. The less transporttaion the better, and again I would commend the logic of common sense that has been applied here in Arizona in working out economies in transportation. Your State policy of seeking to be as self-sustaining as practicable is in pleasing contrast with the economic folly of long-distance shipments of food stuffs not to our hungry cities but into agricultural regions that are devoted to a one-crop program. It was an official of a progressive State of the South who recently protested against the farmers of that State coming in from working their fertile cotton fields and sitting down to a meal of soup from Pittsburgh, bread made from Minnesota flour, meat from Chicago, vegetables from the Gulf States, and peaches canned in California, while their mules were eating Western corn.

Arizona's resources are fairly well diversified and their wise development should build up a commonwalth free from the hazards of disproportionate specialization and unbalanced production. The pace is getting faster and the industrial strategy more complex, however, with the result that the call for highly trained workers in all branches of engineering, agricultural as well as mining, has become urgent. The President of the Michigan College of Mining Technology sees a challenge to our colleges in the fact that the next generation of industrial leaders will start with extensive developments and can not grow up with these industries —these new leaders must be prepared "most adequately for their tasks."

To the engineering that has contributed so largely to industrial advancement all over this Western country must now be joined the social engineering that introduces factors of safety into the human equation. The health and happiness of the units that enter into the social structure must be protected and preserved, else the building is in vain. In a recently proposed code of social commandments the fifth commandment reads: "Thou shalt remember that the end product of industry is not goods or dividends but the kind of men and women whose lives are molded by that industry." The present experiment of the Soviet Government in industrializing the Russian people under forced draft is in direct violation of this commandment. These are sweatshop methods on a nation-wide scale, and the sacrifice of all those personl rights which elsewhere are regarded as sacred may be the price paid for a scrap-of-paper promise of economic salvation. That is too great a price to pay for a demonstration to the rest of the world that conservatism of the human resource is the chief cornertsone of the State.

And here and now I would again urge upon your attention the significant fact that the law of 1862 specifies "liberal and practical education," for today the need for a liberal training has be-

come even more impelling. Arizona has a right to demand not only engineers who can furnish the raw materials upon which civilization feeds, but men and women grounded in the fundamentals of human relationships, graduates of this University to whom has been given the broader view of life. Social progress is the logical partner of engineering advance, and a liberal training must include development of the talent for leadership in human affairs.

Poor Russia has turned to America for engineering advice in rebuilding her wrecked industries, but we can see that the Soviet Union lacks even more grievously wise counsel along lines of human engineering advice in the rebuilding of their social structures. We must admit, however, that even in our own country social and political science has lagged behind physical science and that we have abundant opportunities here at home for employing human engineering in speeding up social progress. There are large areas in our political life that call for exploration and reclamation, and in that work the same principles and talents that have given the engineer mastery over nature can help in obtaining the mastery over human nature.

This opportunity of the University to furnish leaders for the State is as broad as human life itself in this new epoch in the evolution of human society, quickened as it is by the numberless innovations in material things. In my lifetime the American citizen has increased his use of mechanical energy sixfold—that is to say, my share in the machines of industry and commerce is six times that of my father when I was born. With this rapid growth in the economic stature of our Nation have come radical changes in the social environment and in the scope of social needs.

In the earlier years of this industrial revolution there were social consequences of serious and far-reaching extent, but those sad defects were incident to man's use of machinery, not inherent in it. Man himself, not his new machine, was chargeable with his selfish disregard of the working and living conditions of his employes. There is no alibi for the thoughtless owner in blaming his unthinking machine: human greed antedated James Watts.

The industrial revolution is well along in its second century, and now it is called the power age, yet the same demand exists

for keeping the humanistic motives for protecting society in balance with the inventive genius for speeding up industry. Here in the University the rights of man as well as the power of the machine challenge attention, and diverse indeed are the new phases of the research and teaching called for by your progressive and growing State. As a single example, the power problem engages the attention of all citizens who realize how much human progress is dependent upon harnessing the forces of Nature to do man's work. Discussion of possible contacts between the public utilities and engineering schools has taken on a strong political tinge at Washington. Suggestions of cooperation have aroused criticism, and the debate is on. Support of engineering research in problems of mutual interest or plans for vacation employment of engineering students are projects in which the public utility industry can and should reach out a helpful hand to educational institutions, without fear of general misunderstanding or justified criticism of motive. But endowment or subsidy by the industry of any chair in political economy or allied subject readily and properly exposes both industry and institution to popular condemnation. At no educational institution, least of all a State university, should there be the slightest suggesion of controlled opinions.

Control of academic opinion is a very practical matter, and the possibility of interference with liberty of thought and speech is admittedly not a one-sided phenomenon. Attempts to color the teaching of economics or any other subject may be no less insidious, even though exercised in the name of public authority rather than of organized industry. No public agency or official—whether Federal or State, executive or legislative—has any warrant for assuming technical or economic omniscience: the university classroom must be a sanctuary where facts are presented regardless of what they prove and opinions are expressed irrespective of their bearing upon corporate practice or Government policy. Anything short of the open mind and the open forum is antagonistic to educational ideals; any attempt to interfere with the simple task of teaching mental honesty is worse than unethical—it is unsportsmanlike.

Mr. Stanley Baldwin a few months ago in England in addressing a university audience discussed patriotism as a primitive instinct

aroused by the love of early scenes but later developed into the love of serving the home land. That is a powerful motive to noble action, which here under quite different skies can mean letting the love of Arizona mountain and plain furnish a compelling incentive to service for this State. Character is the foundation upon which democracy rests.

In the Colver lectures at Brown last year, Professor Paxson, of Wisconsin, took as his topic "When the West Is Gone" and traced the continuing influence of the West upon the political growth of the Nation. We may follow the historian in the large credit he gives to the pioneer spirit in making and keeping the new world different from the old and yet not subscribe to his belief that the West is gone and that with the passing of the frontier the spirit of the Western pioneer has departed from American democracy. A few years ago before a Western audience I contended that the West is ever new—its spirit of the search for something new, something hid beyond the ranges, in an undying spirit.

So it is that the days of the pathfinder are not past—his task continues, though it is a different task. The new West calls for the opening up of new trails. The frontier today is not a geographic frontier whose obstacles of deserts and mountains and rivers and forests have to be conquered. What remains is the industrial frontier, on which the problems to be surmounted are economic. Not all the sources of wealth have been discovered; not all the land has been brought into full possession of its occupants. And in this conquest the ever new West needs leaders—keen-eyed, courageous men who can blaze new trails in development.

My vision of the resources of Arizona is not a simple picture of quick development and large profits. That would not make for permanence of communities or for security of investments. Far better than this is a slowly and carefully expanding industry which, when it reaches its economic size, still has reserves in sight that promise profitable operation through a span of years sufficient to guarantee not only continued returns to the stockholders but—what means far more to this Western country—continued work for the workers, who in a sense, under our modern ideals of

democratic society, should be regarded as the preferred shareholders in any enterprise.

Wise utilization of Arizona's resources must be measured by other standards than tons or acre-feet or kilowatt-hours. Whether it is in mining town or industrial town, in the city or on the ranch, more homes and better homes furnish the best measure of Arizona's progress. We need not worry about the passing of the frontier spirit if in this youngest of Western States there is pioneering in good citizenship, and in stimulating such pioneering this University should be like a perennial spring from which issues life-giving water.

BEAUTY IN AMERICAN LIFE

LORADO TAFT, L. H. D.

Member of the National Commission of Fine Arts

Before I begin I must tell you how profoundly I am impressed by the land that I have come to. Happy people, happy college, to dwell among such surroundings! Where is there another University so blest? I have seen them all—from Dartmouth to Chapel Hill; from Harvard to Seattle. I have envied Ithaca her ravines and Madison her lakes; I have loved the University of Colorado amid her rocky ramparts, and Montana's Missoula with nature's gigantic monuments in her back yard. I have stood enchanted upon the campus of the University of Washington where, mirrored in her own waters, was reflected Mount Ranier, burning jewel-bright upon the horizon. To each of these far-famed spots I have paid my homage in turn. But when, last night, after hours of restful pleasure in following the pattern of the desert's exquisite tracery, I beheld your "Greater Campus" sweep into view, I could but exclaim, "This surpasses them all!" About me lay the darkening plain, yonder, to the north, your violet-wreathed Acropolis doubled in height by a glowing cloud which rested upon its massive brow like a diadem. I was carried back to the olive groves of Amphissa where towering Parnassus holds immemorial watch. Fortunate people to be able to build your temple of learning amid such scenes. From such a shrine the voice of the oracle should be strangely potent.

One of our wise men has said that "Art is the Ark of the Covenant in which all ideals of beauty and excellence are carried before the people." Another more cynical philosopher observes that "With most of us the chief preoccupation of life is its continuance." In other words, most of us are so busy trying to make a living that we sometimes forget to make a life.

Some eleven or twelve years ago I went to France and was told to talk to our "doughboys." It was one of the most illuminating experiences of my life, those six months abroad with our soldiers. I had never had such an opportunity to know my countrymen. I found much to admire, much to love, and a great deal to be sorry for. I was there to lecture on French art, and I found that the

average American youth wished to hear nothing of art. I was frustrated in my attempts. I had never before addressed an audience which had not come to hear me. But these young men were not there to hear me. They were gathered there at the Y-Hut because it was cold and wet outside. They waited patiently, hoping I would get through so that they could see a movie or a fist-fight. They were heroes and they stuck it out, but they had no interest in my subject. I was there to talk about painting and sculpture, about castles and cathedrals; to entertain, to brighten the weary hours. It was no use. Our boys cared nothing about art; they were immune to it and they resented mention of it. All of which was confusing and disappointing to the lecturer.

In my youth I had had an opportunity to spend some time abroad. I had learned to love French art and the French people Our boys did not care about the French people, they thought them savages. They knew nothing of their history nor their civilization. Why were they so ignorant? I thought of our inheritance. Consider for a moment the character of our early people—admirable, earnest, sincere men, but they did not have the artistic tradition. America did not possess it. Our old-time ancestors who came over in the Mayflower did not bring it with them. I often think of a moss-grown fountain in the Garden of the Luxembourg, in Paris, marked 1620, and I see the parting of the ways—how different those two people were, the French working out their destiny with cunning and delight in the skill of their hands, in painting and sculpture; our people sailing that very year for America, with some very admirable furniture—there is no doubt about that—with certain traditions of beauty, but turning their backs on traditions in general, literally turning their backs on all churchly decorations, sculpture, painting, music. These were forgotten—they represented idolatry; and so the Pilgrims turned their faces like flint in another direction. Take that in connection with the perils of the new land and its exigencies; add the later marvelous growth of manufacturies in America, of things done by machinery—stereotyped, standardized designs—and then add to this enormously developed means of transportation carrying these things everywhere. Do you wonder that a man like Ferrero who knew the hill towns of Italy with all their

picturesqueness and beauty, should say, "Your people are delightfully hospitable, but your cities are so monotonous."

In 1881 I traveled up the coast of England visiting its chaplet of cathedrals along the way. I noticed in one cathedral that while the ancient statues remained in place, the noses were all knocked off. I asked the little old verger about it. He said, "Mr. Cromwell's men did it, sir." (Not Oliver Cromwells), men whose duty it was to go out and bring in everything that was valuable for the king. When they were pressed for time they just broke off the noses "to the glory of God." Works of art created for the glory of God, they were now destroying for the glory of God? I remember reading of one man who boasted of breaking all the stained glass windows in a certain cathedral. Such were our ancestors, and it explains in part our attitude toward art.

Twenty-five percent of our boys in France were illiterate. No wonder the history and art of France had very little interest for them. In the English army only one man in three hundred was illiterate and in the German army only one man in three thousand was illiterate. That is something to remember. I came home from that experience filled with a great resolve to help our youth to an appreciation of the beauty around them. Here is my confession of faith—I hold that as intelligent people we have a right to: (1) All of the beauty around us, the beauty of nature which most of us never perceive; (2) all of the inheritance of the past, of which Americans are particularly unconscious; and (3) to all of the talent which springs up perennially, but which America's rushing life is wont to extinguish before it takes root.

We are immersed in the beauty of the visible world, if only our eyes were open to it. We have a heritage of beauty likewise, in the ideas of men who have created, and spent themselves to do their best. Ruskin said—I do not always think so much of Ruskin—but this time he is magnificent: "The eternal court is open unto you, with its society wide as the world, multitudinous as its days, the chosen and the mighty of every place and time."

Clarence Darrow, the brilliant criminal lawyer, recently used this expression: "Life at best is but a dreary thing." How could he think that? How could he say such a thing? Oh, it may be

true of some people. Life for the average man is full of fear, it has not the solace of beauty. Even Wordsworth wrote once something about the "heavy and weary weight of this unintelligible world." Evidently he was not feeling well that day, for he usually had a keen perception of the beauties of nature. But the average citizen lacks the perception of the beauty around him.

I spent ten years of my childhood close to the University of Illinois, when my father was a professor there. We had very little money. I don't know how many thousand dollars you of the faculty receive here, but $1800 was our limit. Ours was a large house and we had a furnace—our social position demanded that—but in cold weather we lived in the kitchen. I remember that we children used to gaze at the ice on the windows those winter mornings, and trace the wonderful ferns and plants there. Each morning the patterns were entirely different. Life was a novel and thrilling thing; the beauty around us was a constant joy. I remember the pleasure which came to me in looking at the buds of the trees in the spring. What wonderful things these were! They filled my youthful life with joy and I sometimes felt as though I had more than my share of good things. Every day has been an adventure. It makes me want to share these privileges with others.

One summer a number of us went to a lake in northern Indiana. Most of the party were painters, and we used to gather on the shore of the lake to look at the sunset. One evening a little girl from a neighboring farm, whom my wife had hired to look after our baby, came down to see what we were looking at. She watched us awhile and then said, "May I call my people to see the sunset?" We said, "Of course, but they will see it, won't they?" She said, "No, they will not see it; I never saw a sunset until you people came." It is a simple little incident, but I think you will not forget it. How often it is true that people have to be led to see beauty. Sometimes they have to see things in paintings before they see them in nature. Then they remark, "Nature is looking up!" But by whatever way,beauty brings joy into life.

We alumni of the University of Illinois take a good deal of credit for that splendid institution, but we have to acknowledge that there is also something in the personalities of the people in

charge: they do count as well as the good graduates. I am thinking of a day long ago, of a talk given by Dr. Gregory, the first President of the University, on the art galleries of Europe. He showed pictures—beautiful pictures—of sculpture. Later Dr. Gregory extracted fifty dollars from each member of the faculty to start a little art gallery. With those three or four thousand dollars he founded an art collection. This collection was to me like a "new Jerusalem." I date from it the beginning of my love for art. Think what such things may mean to young people. Think what it means to the boys and girls who came to the University, to have a glimpse of those casts and photographs. They saw them and went back to their homes in small towns or on the farm. They never forgot.

What is life for, anyway? Why are we here? I have asked a great many audiences that question and have never yet found the answer. We do not know why we are on earth, but we are satisfied that we are here for progress, and that is the beginning of all wisdom. It may be slow as the movement of glaciers, but if it is steady, if we are really making advance, life is worth while. Thoreau warned people not to become so engrossed in the means that they forget to think of the end of living. Those things which represent the highest ideals of men—literature, art, music—if you are conscious of them, life begins to explain itself. In ignoring these things, we are ignoring things of unspeakable value. Think of the accumulation of beauty saved and passed down through the ages, representing the highest aims and ideals of men. During the war when we believed that Rheims Cathedral was destroyed and Amiens in danger of obliteration, it seemed an unthinkable disaster. It impressed on my mind the significance and value of our inheritance. I told the doughboys how, some seven centuries ago, all the people in many French towns were united in doing something for the glory of God and their home town, in building cathedrals. Each man had a part; they toiled together and so built those wonderful works, recording the spirit of the time. Some did one part of the work, some another. Some contributed the stained glass windows. Every one was interested in this great, growing concern, and "when they went home they left a miracle on the plain," as one chronicler

expressed it. It took in the whole community. We talk of those days as the "Dark Ages." If some glow of those "Dark Ages" could reach our towns in this great country, could give them something of that spirit of unity in working for a thing of beauty, then life would indeed seem worth living for all the people. That is something to dream of. Today our schools and colleges are doing much to give young people an appreciation of beauty in life.

There is a talent, a divine spark, continually, inexplicably springing up in many of our communities, in many parts of the country. It appears now and then in the very best families, but more frequently in poor and humble homes. There is too often a lack of recognition of such talents. Think what it would mean to a community to capitalize the gifts of its young people.

I once knew a French boy, Leonard Crunelle, who had an extraordinary talent. It was the year of our preparation for the World's Fair in Chicago. One day I left my work there on the exhibition grounds to go out and give a lecture at Decatur. As usual, I modelled on the stage and at the end something happened which has often happened since, but never with the same results. A school teacher came up to me leading a bright-looking boy. The teacher told me the story of this young Frenchman who was a coal miner in Decatur. He had arrived not long before with his parents from France, where he had grown up in a coal-mining town. He was obliged to work long hours every day, this boy of seventeen or eighteen, and they told me that in winter he never saw daylight except on Sunday. He was in the depths of the mine before sunrise and came out only after dark. But on Sundays he would go to his teacher's studio, and draw, and paint, and play the violin; and she said he did them all so beautifully that she thought he ought to have an opportunity somewhere. I could not forget the fine young face and the fact that he could understand my French, which was a very diplomatic act on his part! I said to myself, I must give that boy a chance. So I sent for him to come to Chicago. He cleaned pans, carried water, made plaster, and kept his bright eyes open.

How much he was learning no one knew until some months later when he brought me a model of a baby's head, wrapped in a sheaf of newspapers—quantities of them. He unwrapped the papers

and showed me the baby's head, and we all cried, "Leonard, did you really do that?" to which he replied, "Is it good?" Regarding all of his work he only says, "I hope it is good." Such modesty one seldom meets in the artistic world. He told me of his home town in France, a city which, by the way, was completely destroyed in the last war, but he remembered its beauty and its picturesqueness. He told me there were statues in the public gardens and fountains, and the village church had its lovely decorations. He said his mother used to point them out to him.

You can read this mother's aspiration in the name she gave her boy. The name was not the French, Leonard, but it was Leonardo. "You were named after the great Italian artist?" "Yes." "And what did the neighbors say to that?" "Well, they said it was 'outlandish.'" And then I knew the meaning of the word "outlandish"—something that comes from another land! The next son was named Michel Angelo, the next one Raphael, and the next one Andrea—for Andrea del Sarto, I suppose. I do not know how long she kept on. . . . But what a revelation of the miracle of motherhood: this poor peasant woman was able to bequeath to her child the gifts which she did not herself possess, simply because she loved so much.

As I look at Leonard Crunelle's recent "Lincoln," just unveiled in Dixon, Illinois, it seems to me that it is the most original rendering I have ever known of the subject, one of the great "Lincolns" of this country.

That old art collection at the University of Illinois was the greatest source of joy and inspiration to me. There is salvation even in plaster casts if they are kept clean and properly lighted. They need not be dirty. These bits of sculpture were the thoughts of men who tried to express their highest ideals. Such little collections could be started in many towns and would be of great value in catching the attention of our youth.

There are some lines which I can never forget. I have not a verbal memory—most wordings I fail to remember—but these words of Spinoza stay by me: "I cannot believe that the good of this life lies in the possession of those things which, for one man to possess, is for the rest to lose, but rather in those things which all may possess alike, and where each man's wealth promotes his neighbors'."

THE UNITY OF NATURE AS ILLUSTRATED BY THE GRAND CANYON

John C. Merriam, Ph. D.
President Carnegie Institution of Washington, D. C.

In development of science, adequate study of the vast accumulation of materials makes necessary a degree of specialization which will give to each student close acquaintance with the facts bearing upon his problem. A true picture of nature can be obtained only if the investigator sees every angle of the physiognomy of each subject examined. In this acquaintance there must be assurance comparable to the ability we attain in recognizing instantly our neighbors across the street, or our associates in the office. This must be true whether we are considering sea shells from remote areas of the ocean, or infinitesimal constituents of the blood, or barely attainable elements of the starry heavens. Lacking such knowledge, the judgment of science would be open to criticism as resting upon superficial observation.

But intensive specialization brings serious consequences. The student of butterflies, whose soul is plunged into ecstatic tremors by the flashing wings of a rare papilio, may be wholly unresponsive to stimulation by flight of the swallowtail kite which throws the ornithologist into a state of great emotional exaltation. To both entomologist and ornithologist, the intellectual joy experienced by the pathologist in distinguishing from each other two types of almost formless bacteria may be almost incomprehensible.

Not only may the characters or criteria vary in different groups of things to such an extent that the problem of one student is not appreciated by those in other fields, but each researcher tends to dig himself into so deep a hole, or to fly so high, or so far, that often the greater world, with all the other little worlds in it, seems lost to sight.

The day when the "naturalist" could know the details of all subjects is past, but the necessity of seeing the larger field is not less. Many of the major advances in science come through vision of relationship among regions of research which appear widely separated, and yet are connected in a very real sense. So atomic physics of the laboratory has proved to be one of the most impor-

tant tools in study of the stars. There can scarcely be a wider gap in nature than that between astro-physics and problems of biological inheritance. And yet a singularly important question is presented by possibilities of influence by cosmic rays, assumed to arise in interstellar space, upon development of certain elements of the living cell.

Some of the greatest discoveries arise through association of persons engaged in study of widely separated subjects, but each sufficiently broad-minded to consider the relation of his work to that of others. Such advance depends in a measure upon experience or training in fields of breadth adequate to open a vision of the larger picture.

Appreciation of the need for considering each problem of nature in the light of its relation to the larger scheme of things may come from contact with any situation in science or in every-day life. It is, however, possible for us to live long without having this revelation of unity as seen through continuity in operation of natural law in time or space.

Perhaps the earliest expression of this view of unity appeared in the idea of one God in Nature, instead of many warring deities. Certainly there has been no greater stride in human thinking than that which extended to the universe the type of coherence that modern science reflects in the law of gravity, or in the marvelously rigid adherence to rules of movement in light.

But the world of thought is not a level plain. There are mountain peaks and valleys, and a sudden view sometimes gives a startling vision. So with respect to interrelation of the elements of Nature, there are places where the picture reveals with exceptional clearness the idea of continuity in law and interdependence of the features involved.

If one were to take the instant wings of thought and flash though the universe of space and time and movement, there would be many places where the gods of light and darkness, or of sun and rain, might appear together. The phenomena expressed by the surface of the sun, or the long-travelled light from distant nebulæ, would show us much of law. But it is doubtful whether within the range of these wide spaces there would be found a situation presenting as much of continuity through time and action

as is seen in the cinema of earth history at the Grand Canyon. There may be other places on this earth that are comparable. If so, they are few. We have no assurance that close similarity to this particular type of relationship will be discovered elsewhere in the universe.

So, as one of the great features of the earth that lies here at your door in Arizona, I have chosen to turn attention to this concrete thing which touches your intellectual and spiritual life. I look upon it as a treasure house of science—an immeasurable influence upon human thinking and ideals. I recognize it as something that furnishes much remaining to be done in science and art, and, therefore, lays before you one of those greatest of all gifts, the joy of worth-while work. From another point of view, I have taken this thing among many upon which attention might be focused because through its power of stimulation to thought, the Canyon may do more to tell us about man and ourselves individually than we shall ever be able to tell about the Canyon.

In this age of experiment we have established the idea that observation of a process is more important than speculation or calculation. The assumed laws or modes of procedure may be inexact. If so, all results based upon them will express this inadequacy. Experiment is only natural experience in a measure under guidance or control.

History, whether relating to man or civilization, or to the earth, or to astronomy, is a record of experiences. Time and the relative position of events in it represent our manner of describing the occurrences. This expression of experience indicates in some measure the laws which have governed action.

Today the world stands at attention when the astronomer stops in his task to tell us of the history or evolution of worlds, of planetary systems, or of spiral nebulæ. Also, regardless of any preconceived notions, all mankind watches with intense interest whatever comes from investigations on the history of man's long-extended striving to better his position and to deepen his knowledge.

But nowhere in the universe of stars, nor in human experience, nor any other phase of history, do we visualize in a manner comparable to that at the Grand Canyon, the presence of moving

events, with the reality and order of occurrence so visualized that one sees, as it were, the whole panorama in action.

Astronomical measures of time reach to figures that we fail to comprehend. We are staggered by the statement that light moving at its terrific pace would require one hundred to two hundred millions of years for passage from some of the more remote spiral nebulæ to the earth. As you look out over space you see, actually, different ages of the universe in different places at the same moment. At the Grand Canyon you see vastly longer ages, or different times, visualized in the same place. The events are, moreover, here presented in such manner as to express continuity of action extending through them.

Outside the field of geology, I am not aware of any actual measure of events in the universe, even remotely related to observation, which involves more than approximately two hundred million years. The story of the Grand Canyon, as seen in a casual glance, gives us, according to the geologist, a reasonable assurance of considerably more than one thousand million years.

The geologist divides his story of the earth into the astronomical period and the strictly geological. For the first he depends upon the astronomer. There is no observatorial record of this part of the past.

The strictly geological record based upon actual relics which we may examine divides itself into three parts: First, an early or Archæozoic, in which the record is heavily defaced by influences that have shattered and changed the remaining materials. No traces of life are found in this rock system.

A second period, or the Proterozoic, is represented by a vast thickness of layers formed upon the earth's surface by processes much like those in operation today. From these rocks, resembling mud, sand, and gravel of today, we have rare remains of life foreshadowing that of the present.

The third division of time, approximating in length the second, includes most of the great formations we meet generally over the world—tens upon tens of thousands of feet of strata, like deposits of today, and containing abundant remains of plants and animals.

In a single glance at the walls of the Grand Canyon these three divisions of time are clearly represented.

The oldest rocks here shown are the torn and seared remains from an earth of so long ago that almost have the elements destroyed it. The mass was buried at times beneath so deep a load of sediment that it barely escaped complete alteration of its physical characters. It has been shot full of materials that crept into interstices of its shattered body. It was squeezed into mountains and again lifted high till erosive forces in large part tore away its mass. What we have left represents time and antiquity, as does perhaps nothing else that we may touch with the finger of intelligence seeking reality.

The twelve thousand feet or more of strata of the second great series, beginning at the bottom with masses of rolled pebbles including fragments of rocks from the first or earliest division, present a picture of conditions not materially different from those on gravel bars of the Colorado River near at hand. With all of its hundreds of million years of antiquity, it was on an earth as of yesterday that it formed.

To the casual observer, this story of time in the Canyon walls may seem broken by many gaps. But these apparent interruptions are only changes of scene. Where the rolled pebbles of the second great series rest upon the oldest rocks, they are the mute evidences of an uplift during which mountains were formed and washed away—perhaps the greatest single story of the region.

The relation of this seeming eternity of movement in the story of the Canyon to the physical activities of nature of which it is an expression, involves questions which we answer only in part. The natural forces which produced these changes are of two kinds: first, those movements of the outer earth which have lifted the continents and mountains; secondly, the agencies which have molded the uplifted masses of the earth into forms of the land, with lines of ruggedness and beauty.

Of the first element, the movements of the earth now up, now down, the Canyon gives reality, though only partial explanation. But we are not ashamed to say we do not know when gravitation, constituting an important phase of the problem, remains itself today as one of the greatest mysteries of Nature.

More easily visualized are the forces which have molded the land, and have served also to heap the debris in other places to

form new and continuing records. Often, as one stands on the brink of the Canyon, a cloud with slowly changing form floats over. Even as one watches a dark curtain of storm is lowered. Along its path rain lashes the slopes, streamlets flow in the ravines, and the mud-discolered waters begin their journey to the sea. This power that carves and wears the land, and spreads the debris as record of its work, involves the wind that shepherds swiftly changing clouds, and all the features of the atmosphere.

No one who sees this picture at the Canyon fails to realize that as the cloud which shapes itself and vanishes, so is the story of the land. The rocks we see are only fragments that remain from great formations of ancient time. They bridge the short span of eternity which lies immediately behind us.

It is not possible to consider the geological story excepting in terms of the physical forces involved. It is also true that the nature of these elements is in considerable measure interpreted by the way in which they have operated geologically. In a sense the two problems become one.

To what extent the sources of physical power concerned lie outside this earth, is at the moment a question for discussion. Some hold that if not as a cause, at least as occasion, the effect of radiation from the sun, along with gravitational influences, may have a bearing upon movements of the earth's crust. The agencies which lifted the bulk of the great plateau high above the sea may, with participation of gravity, have involved light, heat, and electrical activity, which also give life to the winds and clouds.

The varied features of the scene become one picture, from clouds to forming of the Canyon; from the veil of beauty flung over it by shifting light to the immeasurable power that raised and bent the mountains' mass. Whether it be scientist or only one who comes to glory in the work of Nature, the value of every part in it is most highly dignified when seen against the background of an interlocking group of elements, each most fully interpretable when considered in its relation to the others.

The Canyon has long been a superlative spectacle without reference to any direct relation it might have to the origin or becoming of life Today we see it not only as a place of great physical wonders, but as presenting embedded in its story one of the most

thrilling accounts of the adventure of life through the ages. As yet it is largely unknown, waiting for those who will come to chart these wildernesses of the past. Thank God that the joy of exploration in these primitive worlds can never be diminished by the devastating machine of civilization.

The record of life begins in the lower strata of the second series, the Proterozoic. It leads on up to the highest levels, and then out across the Painted Desert into the highlands to the north the story continues. The multitudes of animals that favored the sea left their skeletons in myriads. Creatures that came out upon the land marked prints of their fingers in numberless thousands on sands of long ago which now form the Canyon walls. Dinosaurs pressed their feet into the soft surface, and the Lord guarded the traces until we could come and wonder. And so into these millions of years of earth building the story of life is woven.

The intertwining of these threads of coming life with those of earth evolution one may not fully understand, but the relation is at the same time the greatest mystery and the greatest challenge of the region.

In the presence of such overwhelming physical features as those of the Canyon, the living things of today that clothe the gentler slopes, or mantle the floor and the plateau above, may seem to have no greater importance than what we have known abundantly elsewhere. But they are of great significance in the larger story of the place, even if it is viewed mainly as a physical picture. In relation to study of the broader history of life, they express some of the most interesting factors involved in the long record of living things entombed in the walls.

As illustrating the idea of interdependence of elements in Nature, the garment of life spread over the Canyon is an outstanding feature of this great spectacle.

In order that comment regarding signficance of the life of the region today may be expressed through concrete example, I have chosen to view the situation by way of a single incident. Riding through the forests of the North Rim on a recent journey to the Canyon, I saw a flash of black and white. The ranger said it was a "Kaibab squirrel, an animal peculiar to this area." In the branches of a yellow pine we saw him well—a striking figure

with the tasseled ears of a lynx, and a plump, black body contrasted with a long white tail. His closest relative, the Abert squirrel, was said to be at home in the country following the opposite margin of the Canyon. Only the gorge of the Colorado separates the forests in which they pasture. But never does either member of the family cross the gulf.

No one who sees these two unique creatures and learns that they live in areas separated only by the Canyon fails to ask how it happens that the boundaries of their range can almost touch without overlapping or mixing of the types. Is it chance that they resemble each other so nearly and are at the same time geographically so close? Did the two species migrate from distant regions to encounter this impassable barrier that prevented their knowing each that the other is there at the nearest point across the way? Or were the squirrels here before the Canyon formed, or at least before it developed as a sharply separating chasm?

That two animals, each of all types in the world most like the other, should journey to a region where they would be separated by such a barrier is possible, but only as a remote chance. That the ancestors of these squirrels were there before the gorge took its present form, and through setting up of the barrier were divided into groups that gradually came to differ, would appear reasonable if there were evidence that one or both might so have changed as to give the existing degree of difference. Acceptance of such a view requires among other prerequisites the evidence that barriers to mingling or migration have been produced by movement of the region or cutting of the Canyon. It also requires evidence that variation in characters comparable to that illustrated in these two forms has taken place in the past.

In examining the story of these two species it is important to note that not alone do the "Kaibab" and "Abert" tree squirrels show this interesting distribution in areas separated by the Canyon. Associated with them, and separated geographically in precisely the same way, are species of spruce squirrel, chipmunk, ground squirrel, and porcupine, along with other types.

Concerning the first question, touching barriers to migration, it might seem that the Canyon has little significance as a bar to movement of plants and animals. Deep as it is, many lateral extensions give entrance to its floor. So far as means of travel are concerned, there is abundant opportunity for animals of all types and sizes to reach the lowest level and climb the opposite bank. The torrential river is a hindrance, but many creatures could find their way over it by swimming. Others would, with time, be washed across on rafts of debris in periods of flood. For some, as badger, coyote, and fox, the range of distribution includes the entire area.

But when the trained zoologist makes his census of life in the Canyon according to location, he discovers that many animals competent to move freely up and down or across do not take advantage of this possibility. When the whole fauna and flora are mapped, there comes out an actual distribution corresponding to altitude and to physical and climatic conditions along the walls. In general, only the species of birds and bats extend across the Canyon area.

The range of climate along the Canyon shows the floor to be something like twenty degrees warmer than the South Rim. In winter, one leaves snow above to pass down through spring into summer. In summer you leave cool nights at the rim to find a zone of tropics below. Standing on the South Rim and looking into the valley of Bright Angel Creek, at the bottom of the gorge, there is seen a region of mesquite, acacia, and cactus with environment of the desert. Looking across to the North Rim, you discover an area clothed with beauty of pine, spruce, and aspen forests. Each zone of altitude has its peculiar conditions of temperature, and of plant and animal life. One looks, as it were, upon the succession of life as an inverted mountain range, with a wide area of cold temperature above, and a much narrower region of warm climate below.

How these belts of physical condition developed, and how they came to have each its peculiar life complement, are questions related to the inquiry whether the Canyon has always existed as we see it today.

Some part of the answer as to history of the gorge appears in the fact that the strata in which the Canyon is cut we find to be in considerable part deposits such as form only on the floor of the ocean. The upper layer of rock in the walls bordering the gorge

is composed largely of skeletons of sea animals including corals and the teeth of sharks. The present position of this limestone, starting at 7,000 feet above the sea at the South Rim, 8,000 on the north side, and several thousand feet lower at the town of Kanab to the north of the Kaibab plateau, indicates an immense change of position through uplift and warping.

While this movement of the strata was taking place, or subsequent to it, the stream cut its way across the mass. The possibility of zones of physical condition developed as the region was being lifted. Today the rocks of this area fill up more than two-thirds of the habitable space in the atmosphere between sea-level and the zone of an arctic climate at 10,000 to 12,000 feet elevation. These belts of climate were, so to speak, exposed by the river as it cut its way.

Whether or no the squirrels were there before the Canyon was cut, there was a time when these climatic zones, with their possibilities of varying life, had not been developed. If the squirrels had been present in the region at any level of altitude before the Canyon was formed, they would gradually have found themselves separated into two groups in areas divided by barriers unfavorable to intermigration.

Regarding the second point—as to whether animals may, in the course of time, change to the extent of difference between these squirrels, and whether such changes have relation to varying physical conditions, we may not answer fully by evidence at the Canyon. But most suggestive data are presented in the picture.

Within the immediate story as unfolded in this book of the rocks there is proof of abundant life through a vast period, in which the kinds changed many times and tended gradually to approach the types living on the earth today.

If one examines the strata in which these remains of animals and plants are buried, the physical conditions that formed the environment of life are seen to have varied through geological time. There was much movement of the earth's crust—from sea to land and back again—through humid, dry, warm, cold. And in a manner keeping pace with these great changes in the physical world, the living things changed through the ages.

So in viewing the situation as a whole, one always returns to

the suggestion that, as crustal movements altered the position of the land, changing the physical conditions and increasing the difficulties of an intervening barrier, the squirrels and other animals came to be different in the two separated areas.

The more closely one studies the time panorama of the Canyon area, the more numerous are the questions raised regarding relation between life of the region and its environment. Above all, we can not avoid recognizing the marvelously expressed relation between development of existing associations or zones of life spread upon the walls, and those changes in physical conditions that produced the walls.

We have seen the picture of the Canyon as visualized by the scientist. But the deep impression made upon him by evidences of unity in operation of the forces represented is in some ways not more important than that in the case of the student of nature concerned only with what is sometimes called the human point of view.

In some respects it is difficult to distinguish the phases of thinking defined as scientific from those known as esthetic or spiritual. The stimulus which drives a great constructive worker in science may separate itself only slightly from that leading the master in art or literature to what he considers his mission.

The scientist takes the impression he has received from Nature as the starting point for an adventure in securing and interpreting facts. The ultimate result of his effort depends partly upon his fidelity to the work of obtaining a knowledge of reality, and partly upon his idealism relative to significance of the facts when brought into relation to others.

The great artist or the writer sets himself to the task of describing not merely form and feature of the thing he sees. He attempts to make clear, also, its meaning to him as an individual human being. In proportion to the extent to which his painting of reality is inaccurate, the writer fails. But he fails completely if his interpretation does not present a true expression of its influence upon him, or its meaning to human kind as typified in his personal understanding or feelings.

It has been stated that nowhere more clearly than at the Canyon does evidence of interrelation in elements and unity of action im-

press itself upon scientist and investigator. Through such visualization of Nature seen as a whole we come often to realization that, even when enlarged by the lens of knowledge, the picture indicates the presence of something beyond, that vision does not fully reach. So, by other means, the artist and writer have presented the idea that, in looking upon these great examples of unity in Nature, what we see may be only the shadowy expression of things greater still, which neither eye nor mind has yet been able to define.

GREETING

His Excellency John C. Phillips
Governor of Arizona

We have assembled today to perform a pleasant duty. The inauguration of the chief executive of an educational institution has for years been made the occasion for congratulation and the expression of good wishes, and in this instance it is truly such an occasion.

We are installing a man as President of the University of Arizona who has already endeared himself to us, one who has shown such ability and such a whole-hearted interest in the needs of the University as to cause us to enter into this official inauguration with enthusiasm and pleasure.

Our University represents the highest point we have been able to attain in giving to the young people of our State an opportunity for higher education. It has grown from a small institution to its present splendid proportions, and we are justly proud of this growth which represents a large expenditure of money, time, and constructive thought. The standards of the University have been raised until it is now on a par with some of the leading educational institutions in the United States.

The ambition of our citizens did not stop with the building of these beautiful buildings, landscaping of the grounds, which are our pride, and equipping the buildings with the most modern equipment we could afford. We then looked for a man to head the institution who would bring to it ability, stability, breadth of thought, progressive vision, up-to-date methods, and, above all, strength of character. I believe we will all agree that the noblest fruit of education is character.

In Doctor Shantz we have found a man who has all of these qualifications and more. We have a man who personifies service in its highest and noblest meaning; a man whose vision is coupled with constructive action and a desire to give to the University and to the world the best that he can give.

The position of president of a state-owned university calls for a very versatile man indeed. I might say that even more factors

and factions must be dealt with than are encountered in holding the office of Governor. His relations with the Board of Regents, the faculty, students, parents, the legislature, and the general public, all call for a different and special quality of tact, paternalism, and diplomacy. He must face situations requiring courage which tries men's souls. His professional loyalty must at all times prevail against his own personal preferment. However, in all of this there are compensations. His relation to the students, carrying as it does a paternal element, opens up avenues for the accomplishment of untold good. His influence is unlimited, reaching far into the lives of the students and leaving its impress upon their future.

It has been my privilege to become well acquainted with Doctor Shantz since he came to Arizona. I know him as an educator, as a scientist, and as a sportsman. From this acquaintance I speak my full appreciation of the man whom we have chosen to head the institution which is dear to every loyal citizen of Arizona. We have made no mistake in our choice, and it is my fervent hope that Doctor Shantz may remain with us and live to see our dreams and his dreams for the upbuilding of our University become realities.

INDUCTION INTO OFFICE

FRANKLIN J. CRIDER, M. S.
Acting Chancellor; Director, Boyce Thompson Southwestern Arboretum

GOVERNOR PHILLIPS, FELLOW MEMBERS OF THE BOARD OF REGENTS, DELEGATES, MEMBERS OF THE FACULTY, STUDENT BODY, ALUMNI, FRIENDS OF THE UNIVERSITY:

This day marks another forward step in the history and progress of this institution; in the training and culture of the young men and young women who enter its doors; in service to all who come within its sphere of influence; in the development, through research, of the natural resources of this great, new State.

A university is a complex organization with correspondingly complex problems. Our own University, unparalleled in natural environment and unhampered by tradition, presents unusual challenge to its leadership. We may congratulate ourselves upon having as the head of this institution a man who, in breadth of vision, understanding, and successful accomplishment, is eminently qualified to carry forward the work from its present high state to still greater attainment.

And now, Dr. Shantz, acting as the representative of the Board of Regents on this occasion, I formally welcome you as President of the University of Arizona and commit into your hands the future welfare of this institution, confident that your administration will bring increased usefulness and added renown to our beloved State University.

INAUGURAL ADDRESS OF HOMER LEROY SHANTZ AS PRESIDENT OF THE UNIVERSITY

CHANCELLOR CRIDER, GOVERNOR PHILLIPS, REGENTS, FORMER PRESIDENTS, DISTINGUISHED GUESTS, DELEGATES, FACULTY, STUDENTS, AND OTHER FRIENDS OF THE UNIVERSITY OF ARIZONA:

I accept the presidency of the University of Arizona as a challenge to meet a great opportunity and at the same time to undertake a great responsibility.

The University of Arizona was established by constitutional provision and is the head of the school system of the State. It is also a land grant college, established and maintained by the State with the aid of federal funds. It is the largest single state institution in Arizona. It is governed by a board of ten regents of which two, the Governor and the State Superintendent of Public Instruction, are ex-officio members, and the eight other regents are appointed by the Governor of the State each to serve for a term of eight years.

The University is composed of the following organizations which come under the jurisdiction of its President: The College of Agriculture, including a Department of Home Economics and one of Vocational Teacher Training; the College of Education; the College of Law; the College of Letters, Arts, and Sciences, including a School of Business Administration not separately organized; a School of Military Science and Tactics; Divisions of Physical Education for Men and Physical Education for Women; two organizations for adult education, the Agricultural Extension Service and the University Extension and Correspondence Division; and a Graduate School not separately organized. In addition we have four research institutions, the Arizona State Museum, Steward Observatory, the Agricultural Experiment Station, and the Arizona Bureau of Mines. There are also the following affiliated organizations: The Arizona State Laboratory, the Pioneers' Historical Society, the United States Bureau of Mines, the United States Geological Survey, the Bureau of Plant Industry, the Bureau of Biological Survey, and the

United States Forest Service, which maintains at the University the Southwestern Forest and Range Experiment Station. The President of the University is also ex-officio member of the State Board of Education and of the State Board of Vocational Education.

The University therefore is a complex organization, bringing together under one central control many agencies of higher education, adult education, and research. It represents a combination of many of the State's non-political functions. As head of the public school system, it must assume the position of a sympathetic and inspiring leader. It should offer to the graduates of our high schools and junior colleges opportunity to acquire a broad cultural foundation and to supplement this with the specialization necessary for a chosen field. It should inspire the few who are capable of leadership to still further endeavor in the graduate field. It should be a leader in the advancement of knowledge, seek to find new facts and to reinterpret old ones. It should gather the wisdom of the ages to the end that it may inspire its students, inform the people, and expand the industries of the region. For industry the University should furnish a resource survey, a fact-finding organization, and a training ground for young men and women. It should be a non-partisan guide and counsellor of the State's economic and industrial systems, looking never to personal or partisan gain but to the present and future welfare of the people.

The most important factor in the success of any university is the character of its staff of workers and teachers; buildings and equipment are much easier to secure and to maintain. At present the financial rewards in the commercial world are so much greater than in teaching or research that many men are drawn to this field. To insure our students the best teachers, to assure our State and industries the best leadership, we must with extreme care select men to strengthen our institution and reward those already in the service who are doing outstanding work. Teachers cannot be judged by a single standard, and we should not strive to reduce our faculties to teachers of the same general type. Variety is needed in a university. Drill-masters are useful, and inspirationalists are a necessity, but above all, sympathy with the

student should be indispensable in every teacher. Age and experience are not in themselves qualifications for good teaching, nor is any special brand of training or any particular union label a guarantee. Mere textbook teachers should have disappeared before the university is reached, and the professor who cannot bring to the daily lesson a wealth of outside illustrations and something in the way of original material cannot properly qualify as the best type. A professor must grow in knowledge of the subject he is presenting, since stagnation is the only other alternative. Our best teachers and our best research men are continually striving to strengthen their qualifications.

There is no sure method of securing a good faculty except by continually discouraging indolence, lack of interest and sympathy, inability, and disloyalty, by trying to correct maladjustments and by continually rewarding effective work. The relation of the man to the welfare of the whole university is a better criterion than his value to any department. As a rule, departments can only be strengthened and maintained by adequate salary recognition. The addition of new men is occasionally essential but on the whole the improvement of the opportunity and salary of those we have is better for the institution than expansion in numbers. Our University and the people of the State cannot afford to see good men drawn away from us to other states simply because these can offer higher salaries. We cannot be satisfied with any but the best, and if that is the case we must be prepared to meet competition with other institutions.

Our student body is an unusually diversified group. It comes from every part of our great State and from every portion of the United States and even of the world at large. The climate here will favor a great many out-of-state students, who, like our pioneers, bring their allegiance to a new state. Our institution will profit by the cosmopolitan character of its student body. We offer attractions to students from the desert, semi-desert, and subtropical countries, which cannot be so easily met by the majority of other institutions. One of the most potent factors of education is here present—the mingling of students with widely differing home life and background. Such fellowship will give something invaluable in after life.

The University will rise to the position it should occupy only with the aid of the student body. Students, with the help of a good faculty, can raise the standard of scholarship, of happiness, and of moral well-being on our Campus. On this score we have no apologies to make to the best institutions in the country. The ideals of students and administration are identical in the main: To raise the standard in pure joy of living by improving the intellectual, physical, and moral ability to enjoy life both in the University and in later years. Here the greatest opportunity confronts our fraternities and sororities. An intellectual fellowship can take the place of a driving activity program without in any way decreasing the benefits of activities. By building up an intellectual comradeship, fraternities and sororities can contribute an important element to American education. In a democracy, the best men and women in the student body must assume leadership, and not permit this leadership to be usurped by those less capable but more vociferous.

We want our University to do all it can to enrich the lives of our students. But only four years are set aside for this university education. What is the University expected to accomplish in four short years of time?

To teach the proper use of the English language, both written and spoken.

To introduce the student to the various arts, letters, and sciences.

To train his mind to orderly endeavor and to give him so much of impetus that he remains a student for the rest of his life.

To develop a moral fiber and fitness to be among the best of any community.

To develop a religious life, to establish a healthy mental attitude, and a faith in the essential goodness of humanity.

To develop a social consciousness and an interest in the State and Nation.

To establish habits of right living and of physical health, a good personality, solid poise, and good manners.

One often hears it said that learning is not as important as a degree of social polish and the ability to meet people. The whole

of life is given to these latter things, constant opportunity after leaving college, constant opportunity before entering college. Cannot four years of a long life be devoted to a passion for learning? Should anything take its place; should not this passion, so nearly akin to the old spirit of exploration and adventure, which possibly yields greater permanent pleasure than any other, be cultivated and nourished for at least this short time? Should we as educators allow anything to take its place? Let us do all we can to keep alive intellectual curiosity and not crowd it aside and demand only practical results. The kindergarten method should not be carried through to the Ph. D. degree. Somewhere along the line the student should be taught to appreciate the difficult task—to welcome hard work, and accept mental discipline. Mental curiosity cannot be stimulated, and mental power cannot be developed by merely stuffing the student with facts, no matter how carefully selected and arranged these facts may be. Education is not pouring oil into a vessel, no matter how fine the alabaster of the vessel and the workmanship displayed by its construction, and no matter how old and precious the oil which the faculty may pour in. Rather education is a subjective growth and the institution can only provide the soil, the moisture, the sunshine, and the favorable environment. The spark of life must be there, as no institution can grow oaks from cocklebur seed. The student must acquire his education by conscious effort; without this it cannot be given to him by any method yet devised.

The College of Letters, Arts, and Sciences is basic to the work of all colleges, since it offers the foundation work in science, language, and the humanities. It is not only basic to all other colleges but has largely the responsibility of carrying forward the banner of general culture against the insistent demands for machine-like efficiency of a vocational type, sponsored especially by those who have espoused education as a vocation rather than an intellectual adventure.

The College of Law has recently moved into a building entirely reserved for its use—probably the best equipped college on our Campus. It has, we believe, reached the requirements of the American Bar Association and the Association of American Law Schools. Here the atmosphere and spirit of the Law College can

be constantly maintained. I covet for every department a home in which something of the spirit and culture of that department may be ever present, where their books and illustrative materials are at hand, and where students and Faculty can mingle in intellectual fellowship and learn to appreciate each other.

Our College of Mines and Engineering, in a state in which mining is the chief industry, serves the State by furnishing trained men to this industry, and by furthering scientific investigation of a more fundamental nature than can be undertaken by the mining companies themselves.

The College of Music is the last one to have been organized in our University, and the demand for trained musicians in our schools far exceeds the supply. This College is interested primarily in raising the standards of musical instruction and musical appreciation in the State.

The College of Education has the responsibility of maintaining and raising the standard of teaching in our public schools, and enabling their teachers to pursue post-graduate work. It keeps abreast of the best movements of present day education, tries out fads in teaching, and sifts out the chaff from the wheat. One cannot escape the conviction that too many people turn to teaching and that a fitness for teaching and a consuming desire to help our young people should be the only reasons for entering the field at this time. Those who plan to teach should not be satisfied with a minimum of preparation but should strive to secure the best training this University or any other can offer.

The chief function of the College of Agriculture is to train leaders who will help in guiding this industry. Up to the present, the supply of trained men has been inadequate to meet the demand. Agriculture rests on foundation work in science, language, and the humanities, all of which are at present taught in the College of Letters, Arts, and Sciences. Since the professors in the College of Agriculture serve largely in the Experiment Station as well as in the College, the students are brought into close touch with men who are doing research work along their respective lines.

There is also in this College a department of Home Economics and a department of Vocational Teacher Training, supported partly by the Vocational Education Department of the State, with

which the work is closely affiliated. Agriculture and Home Economics turn many of the students, on graduation, to Vocational Agriculture, Agricultural Extension, or to research positions in the Experiment Station, or in the federal services.

Adult education is playing an important part. Our Agricultural Extension Service reaches every part of the State. It is planned to bring to the farmer and housewife the knowledge which is continually being accumulated relative to their practical problems. It also extends to the boys' and girls' clubs. Reaching as it does every part of the State, it is an invaluable agency for reducing the creative work of the Experiment Station to farm practice and for bringing in from the farm for investigation the problems in need of solution. Besides its purely educational phases, it is often engaged in extensive surveys, and last year completed an important economic survey of the Salt River Valley.

At present we have no separately organized Graduate School. We have, however, many departments adequately manned to give masters' work and several groups of departments which can prepare students for the Ph. D. degree. In certain lines our opportunity for training men in research is unexcelled and we should here, as well as in actual research, take advantage of our equipment in men, laboratories, and geographic environment to build up our work along these favored lines. In graduate work only those who are themselves productive scholars should be recognized as major professors, and we should never fall below, but not try to rise too far above, standard institutions in our requirements for the master's degree. The Ph. D. degree should rarely be given, and then only to exceptionally capable men if it is to retain its standing as a research degree, rather than fall to a merely teaching degree. Research is one of the important functions of any state university and land grant college. Naturally productive scholarship cannot be closely confined, and each man must choose for himself which lines of work he can most successfully pursue. This may apply to the professors as such, but the research divisions are established to accomplish definite results. The field is usually so broad that there is no great interference with opportunity for individual preference.

The Bureau of Mines and the Agricultural Experiment Station

touch two of our greatest industries. In both of these lines we must have men who demand the respect of the leaders of these industries. Only men who are free from personal affiliations, and interested in the industry as a whole, can give their lives to the solution of vital problems.

In order to appreciate the position of a productive scholarship in our intellectual world, in order to glimpse to a slight degree the results of scholarship—especially those phases known as scientific research—we must call attention to some of the accomplishments and their effect on our modern philosophy. Scientific accomplishment of recent years has rested on a relatively small number of people occupying positions of little or no direct political or national influence. Yet those men have revolutionized our conception of the universe and the world about us. With the scientific method of approach, a few great men have explored the universe, have pushed the earth from the center to a minor position in the Galactic system; have looked out into space and back in time 200 million years; have determined the chemical composition of stars by means of light which began its long journey millions of years ago. Another group has looked into the composition of matter and has found here the nucleus like a sun, and the electron like a planet—a miniature solar system with open space almost equal to that of our solar systems; have shown that even in our densest substance space is no more crowded than in the Galactic system, and that the relation of matter to space is no closer than would be one horned toad in an area equal to the State of Arizona. In biology they have determined the structure and mechanism of heredity, the wonderfully complex system by which characters are carried from parent to offspring, have produced new strains of plants and animals, and have predicted future phenomena as in the astronomical world.

Distance has been annihilated to some extent by rapid communication. Those who listen to this address by radio will probably hear it before those hear it who are in this room. By the time the voice has reached the front rows the wireless message will have traveled 1,700 miles, or as far as Chicago, and by the time the voice will reach the back of this room the wireless message will have had time to travel 25,000 miles. In other words, light

or electricity could go around the world and reach the back of this room while sound is traveling directly. Traveling at this rate light requires over four years to reach the nearest star, and about 200 million years to reach the most distant star known to our science of astronomy.

By many different methods science has estimated the age during which our geological history has been written, or the length of the age of sedimentation, at about one and one-half billion years. Let us represent this period of time by the 12-hour dial of a clock, a device often used. On this scale a year would equal 1/35000 of a second, and a minute of time on our clock dial over two million years in our earth's history. For millions of years water drenched down over the earth's land surfaces carrying down masses of sedimentary material to serve as a record of geological change. The hands of the clock moved on, 35,000 years per second, two million years for each minute, to one—two—three—and even four o'clock before any record is found in the rocks of life on the earth. Then there appeared the green plant cell, able to build the physical and chemical forces about it into living material. It solved the two greatest requirements of life—the manufacture of food and the reproduction of kind. On this simple process of food manufacture, the biological world was built. The clock dial had moved on to almost nine o'clock, or over a billion years, before plants were able to leave the water and develop the great land types of vegetation—before a semblance of forests and grasslands could be developed. The process by which water plants were able to move out onto the land areas and adjust themselves is one of the most interesting chapters in plant history. A root system to collect water and nutrient salts, and a shoot to hold the leaves out in the air, enabled the plant to bathe its tissues constantly in a stream of water which entered at the plant rootlets and passed out as vapor from the leaves. This stream can be stopped only by stopping entirely the inflow of carbon from the air and therefore stopping entirely food manufacture. Therefore the growing plant must maintain a constant stream of water through its tissues.

Over the great land areas rainfall moistens the soil surfaces and from this soil moisture the plants draw up water and pour

it back into the air. This cycle has gone on through millions of years. At present the average rainfall is about 30 inches per year. At this rate one mile of rain water would fall in 2,000 years. If the age of sedimentation is one and one-half billion years, three-fourths of a million miles of water could have been poured over the land areas in this time. Our oceans are about two miles deep, and the oceans therefore would have been poured over a land area equivalent to our present area one-fourth of a million times. On this natural phenomenon of drenching the earth with water we have built up our agriculture, forestry, and grazing. Physiographic changes have produced areas of land which have remained in place until vegetation has become relatively stable. The earth materials, a mere mass of dirt, has changed to ordered materials to form what is now referred to as a soil.

The rate of use of water by plants is now fairly well known. A plot of alfalfa the size of this room will pour into the air a ton of water every two minutes during mid-summer and every ten minutes during our winter months. The lawns about this buildings are now losing a ton of water every five minutes. A 10-acre field of alfalfa in the Salt River Valley during summer and mid-day will pour into the air a ton of water every ten seconds. Alfalfa can grow only with a constant and adequate stream of water passing up through the plant.

Plants have naturally pushed from water to dry areas by many morphological and physiological adjustments. In our deserts some plants succeed in escaping drought by springing up following rain and completing their growth before the soil moisture is exhausted. Others avoid drouth by such wide spacing or so small an amount of growth that they conserve the soil moisture by using it up very slowly. Still other plants—and here belong most of our desert forms—can stand for long periods in a dry air and soil and resist death. These plants rapidly resume growth when water becomes available. Other plants like our giant sahuaro and viznaga and chollas are water reservoirs filled after each rain. Plants have pointed the way to man by which the deserts can be occupied, they have developed short-season crops, sparse planting to secure drought avoidance, and have practically impounded water in their succulent bodies for continued growth.

Within our period of history our race has encountered no such conditions as faced us in adjusting our modern life to conditions found in a desert state. Ancient peoples in Asia and Africa faced somewhat the same climatic conditions and developed an irrigation agriculture. But this agriculture was never asked to be efficient, was supported by an unlimited area for exploitation and expansion, and to quite an extent was based on natural irrigation or flooding. This, although a part of the intellectual world's history, was in no way a part of our racial development. We came from the hunting, fighting past in a region of deciduous forests and cold winters where we developed an agriculture based on a natural rainfall and a relatively non-productive soil. The maintenance of tilth and fertility was our chief problem and this we have only partly solved.

The greatest agricultural expansion came when civilized man undertook the cultivation of the great tall grasslands or black soil areas of the world. This came very late and developed the grain trade of the world as we know it today. Here were lands productive beyond any type before available and needing neither fertilizer nor irrigation to make them productive. These are now the granaries of the world.

The move from this background, covering as it did a dozen centuries of time, to a subtropical desert irrigation agriculture a fraction of a century old, is a step that calls for adjustment along almost every line. The whole matter of irrigation is new to our race. The methods of handling and supplying water, methods of crop production, of soil management, of handling domestic animals, and of marketing crops produced by the intensive method, must be worked out. We can point with pride to a wonderful irrigated valley and to success beyond our fondest hopes along these lines. This State is dependent to a larger extent than most other states upon success in irrigation farming. Our greatest shortage is acre-feet of water. We have more acres than acre-feet. It is therefore most important that we utilize this water to the best advantage. An acre-foot of water should never be wasted on an acre of poor land. The danger is two-fold. To place water on an acre of seep-weed land is to product no crop and to carry into the subsoil water supply an amount of salt and black

alkali which is sure in the end to cause damage to other lands when pumped for use lower down. Our type of irrigation is a young industry. Other irrigated lands—irrigated by other races—have failed again and again after a first almost unbelievable success. The old Indian canals are a warning to us, as is also the falling off of yields in other states. Water added to land, and much of it flowing out through the crop and lost in evaporation from the surface, tends to leave harmful salt behind. The physical conditions become gradually worse, base exchange, which at present is too little understood, tends to make the land physically and chemically unfit for agriculture. Already thousands of acres have been lost to cultivation in the United States, and thousands reduced in rate of production. The problem here challenges the plant physiologist, the soil physicist, the soil chemist, the irrigation engineer, the agronomist, and the horticulturist, and demands for its solution the best that science can g ive. Only a slight beginning has been made on this problem which to us is so vital that it cannot be overemphasized. If water is our chief limiting factor we cannot economically apply it to poor land. If water is our chief limiting factor we cannot use wasteful methods of application. If water is our chief limiting factor we should not grow crops which are extravagant in the use of water in proportion to their monetary return. We should be careful to secure the greatest return from every acre-foot.

At this time there is an insistent demand in the United States for a reduction in the acreage of agricultural land, but Arizona cannot stand still in its agricultural expansion without greatly damaging its people. It lies too far from the great centers of agricultural production to be an important competitor. It is fortunate that most of its produce is diversified and is either grown out of season or used for home consumption and is not therefore directly competitive with any of the great centers which have in past years suffered from overproduction. Guidance in the agricultural field may well save us the depressions and catastrophes which have come to so many other sections.

The cooperation of different industries in our State is indeed fortunate. To some extent we are nearer advanced European countries in this regard than any other state in the Union. Our

greatest irrigation district is a good example—where water for use in crop production also furnishes in its fall power for mining and other industries. Both gain immensely by this cooperation, and the industries create a market for agriculture, and agriculture supplies the demands of the industries.

The shift from the mere maintenance of herds, the pastoral state, to a profitable production of meat for our ever-increasing population, encouraged the overgrazing of our pasture lands until the returns are now greatly reduced. Reduction in carrying capacity is accompanied by more rapid erosion—and the erosion problem, important in maintaining the range, is alike important in connection with the problem of silting up our reservoirs.

The rate of plant growth is to some extent dependent upon the size of the plant, and close grazing first cuts down production and if continued eradicates the desirable species. Many important food plants are disappearing from our range, and over large areas palatable grasses are being replaced by worthless herbs. The latter require as much water and nourishment as the palatable grasses. No quick method of re-vegetation, either to prevent erosion or increase carrying capacity, is known, and a half a century may well be required to return these areas to a normal state of production and protection. It is probable that with the proper system maximum production can be maintained with very nearly maximum protection. To fail in this management is to kill the goose that laid the golden egg. In some cases the range has actually been destroyed and in most cases so overgrazed that it cannot be returned to full production without years of careful management. We may have to make some present sacrifice in the interest of the future.

It is almost inconceivable that we know so little concerning the plants on which our whole range industry rests. The facts concerning the plant cover, the climate, the soil, the management of animals, still call to us for study, and adequate management cannot be undertaken without an understanding of these facts. As well expect the engineer to build a bridge or a skyscraper with no data on strength of materials and the effect of varying temperature and moisture on expansion. We built bridges before we knew—as we have grazed cattle before we knew—but no modern

building can be constructed without such knowledge, and no modern state can allow one of its major industries to move forward in the dark. The industry has nothing to fear from a scientific approach to its problems. In the end this approach is the only salvation. Every man knows that the range today is only producing a fraction of what it originally or normally produced. A fallacy lies in the assumption that decreased production is necessarily correlated with grazing by domestic herds. Production is dependent largely on water supply, a productive soil, and a cover of suitably adjusted palatable species. When the edible plants are killed out, weeds come in to consume the water supply and are the direct result of mismanagement in grazing. With more knowledge we can return and maintain our range in a high state of productivity.

In our State, forests are grown largely on land not suited to crop production, consequently the State should have this crop always at its most productive stage since it is more valuable than any other crop that can be produced and is valuable in a secondary way in maintaining water sheds. Destruction of our forests might easily result in great damage to the reservoirs lying below.

Except for the universities of the Coptic world, Arizona stands alone as a desert university. It should capitalize in every way its environment. It should interpret the great experiments nature has here set for our use. It should not look with envy at other institutions or try to follow their example but should undertake those tasks for the solution of which nature has so richly favored us. Let us build here an institution adapted to our geographic location. Let us study our desert vegetation, the factors which control it; our desert animal life, its dependence on vegetation, soil, and climate; our desert physiography and climatology; our geologic base and the present and future wealth of mineral and rock deposits; our water supply—both surface drainage and ground water; study our language, our history, our archæology and our anthropology, and use our clear sky for better astronomical work; capitalize our environment, material and physical, to build a higher mental and spiritual state.

Our laboratories lie out of doors and in many fields. Arizona has great variety of climate, soil, and vegetation. A small part

of the State lies above the timberline, as if it were above the Arctic Circle; a small area but none the less precious to those who need variety, and as a great natural experimental area. Below this, the cool northern spruce fir belt, too cold for ordinary crop production but an area valuable as recreational land.

A large portion of our State is yellow pine land—timber land --dry-farm land—valuable recreational land, and an area capable of developing quantities of wild animal life. The Kaibab with its wealth of deer is a biological experiment in competition and game management on a huge scale. Below the yellow pine lies a great sclerophyll brushland, a land of unusual biological interest a country which can be, with water, made into an Italy, an Algiers, a country where cork oak and olive can be grown, a country similar to that developed to a high state in Rome and Carthage, in Spain and Tunisia.

The desert grasslands are ideal grazing lands, part of the world's natural big game country. These are now given over to domestic herds of goats, cattle, and sheep. Here lies wealth but for the asking, but which demands at the present more knowledge and more skill in the handling if it is to continue productive. A country similar to that occupied by Arab and Bedouin—a grazing land, the home of people who have known only freedom, and here the home of our aristocrats, the stockmen who, proudest of men, may not see the need of more exact biology to solve their problems before it is too late.

Botanical science can here find vegetation ranging from subtropical to arctic. Lying here stretched out in great belts easy of access and within comparable distance lies the answer, needing only a scientific instrumental interpretation, of the distribution of our great plant communities, the type of soil and climate required by each and the key to the physiology of the dominant species. This study, of immense scientific and practical value, is the key to most of our problems of agriculture, forests, and range, a sure guide to future agricultural development. No state has yet undertaken on an adequate scale the interpretation of the record. Here is an opportunity to combine the work of the University department of biology, the Agricultural Experiment Station, our neighboring institutions, the Desert Laboratory and

the Boyce Thompson Arboretum, and our co-workers in the Forest Service and Biological Survey, in a program which shall increase many times the opportunity of each worker in the field and lead to results basic to forestry, grazing, and agriculture, and provide invaluable data for climatologist and physiographer as well.

Arizona still retains most of its original fauna. The value of this fauna to the State is very great. Not only does it add immensely to the pleasure of tourists and hunters alike but affords an excellent out-of-door laboratory for biological study. Our State varies from the overstocked deer range down to the desert fauna which, like the desert flora, is unusually rich in species although showing a paucity of individuals. Plants and animals living in the desert have moved farthest from their original environment and are therefore among the most highly specialized organisms on earth. Biologically, no out-of-door laboratory could exceed that which lies at our very doors, and the desert is our province. Here are problems by the thousand, and we have only a few workers. Add to this desert our great altitudes with the change to perpetual snow, and our out-of-door laboratory is far beyond our power of adequate utilization for years to come.

Our desert air and our observatory, adequately equipped, aid us in furthering astronomical exploration and research. A state not yet fully explored offers an excellent field for physiographer and geographer. The discovery of a hitherto uncharted mountain range, the discovery of a new comet, and the dating of our archæological ruins by an indirect botanical method are among our recent accomplishments.

Many of our citizens speak Spanish, and Mexico is our neighbor on the south. Spanish is by geographic location our principal modern language. Arizona is one of our oldest states. We are therefore interested in the history of the Southwest.

Backing our history and leading on to distant days stands archæology. The student of archæology finds here a wonderful out-of-door laboratory with thousands of old ruins at hand to explore and interpret. Man moving into our continent from the Northwest has left his trail as he passed on into Mexico and South America. The early migration lies deepest and successive

stages appear above until today we merge with present-day anthropology in the study of our remaining Indian races and their social and economic adjustment to present-day conditions. Archæology and anthropology are ours by right of geographic location. To know and understand this phase, our surface geology and physiography must be worked out. Great changes in these fields here lie exposed, not obstructed, by a dense plant cover and calling for interpretation. The canyon of our Colorado is a page in world history of incalculable educational value. The able address of Dr. Merriam emphasizes the value of the great natural experiments in placing before us the wonders of our geological and physiographic history.

Here are problems for every member of our staff, be he interested in science, letters, arts, or the humanities, and here are problems to tease the interest of our growing young men and women. To develop their curiosity should be one of the major purposes of education.

A traveler into a new land can bring back only that which he is prepared to receive from his new experience. Rupert Brooke in describing the Canadian Rockies deplores the lack of the leaf mould of history so evident in English woods, where knights and dryads, armies and fairies walk before the eyes of him who has a literary or historic background. The idea is nicely expressed—the richness of the historically ancient English and the barrenness of the Canadian forest unknown until recently. But the man of science also has vision. He sees the march of time through millions of years, the forms of life unfolding, new forms originate, lilies change to grasses to clothe the earth, forests develop, erosion shape the mountains and the canyons. The past as well as the future lives in his mind's eye. In fact, fairies and dryads walk for the man of science as well as for the literary man.

You listened this morning to three able addresses, each of which indicated clearly the opportunities lying just beyond the present for those who are working in this University. The field for work in geology and study of mineral deposits, set forth so ably by Dr. George Otis Smith, needs no further discussion by the speaker. The cultural and educational value of our Grand Canyon, a living past, as presented by Dr. John C. Merriam, has

brought to you the value of this great out-of-door laboratory. Professor Lorado Taft has inspired in you a love of beauty and culture, has indicated these less tangible but none the less real phases of life which fire the imagination of men and make life really worth while. In emphasizing our local opportunities I have not meant in any way to imply that we should not take a broader point of view in our work here. No local problem can be solved adequately without being properly adjusted to its place from a world point of view. Our University must not confine its endeavor to our State alone—it must take its place with others and bring to our people the culture and knowledge of other times and other peoples and above all must not be provincial.

Arizona with an area of 134,000 square miles or greater than that of New England and equal to that of Ohio, Indiana, and Illinois, has less than 500,000 inhabitants. Of our land area one-third is Indian reserves and national forests. Less than one per cent of our land is under cultivation. The valuation of the State last year was 700 million dollars, of which mining property amounts to 290 millions, railroads to 110 millions, and agriculture to 97 millions.

Those who guide our University must inspire our people with confidence by seeing to it that this institution does not outgrow the State. Our University should not attempt to occupy as much ground as is covered in wealthier states. Rapid expansion and enormous size have been the ideals of too many of our institutions. Although our State is small and because it is small in total budget and number of people, we can and should do better work than institutions driven by masses of people and masses of money. Our University can safely advance only with the guidance of our best advisors. It must advance slowly since rapid change is always dangerous and often exceeded in undesirable character only by stagnation.

What I most covet for our University is a group of men and women interested and happy in their work and anxious to do justice to their associates; a student group willing and happy to help each other and to cooperate with the Faculty and administration; a state anxious to further the aims of education and research; all willing to differ honestly, without animosity, and to

lay aside petty difference in a whole-hearted endeavor to aid our people to see a little farther and a little clearer into the future and to meet with greater knowledge and faith the problems of an ever-changing world.

24353

END OF
TITLE